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Appendix A:

Background Document for the Listing of
Primary and Secondary Oil/Water/Solids Separation Sludges
from the Treatment of Petroleum Refinery Wastewaters
-- Recorded Environmental Damages

U.S. Environmental Protection Agency
Office of Solid Waste
401 M Street, SW
Washington, D.C. 20460

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1. INTRODUCTION

The U.S. Environmental Protection Agency is required to take the lead role in ensuring coordinated and effective governmental action to assure the protection of the environment by abating and controlling pollution on a systematic basis (40 CFR §1.3). To enable it to fulfill this mission with respect to solid wastes, Congress has given the Agency the authority, under §3001 of the Resource Conservation and Recovery Act, to list wastes as hazardous and to require that they be managed in accordance with the Agency's hazardous waste management system.

The Agency has previously determined that two oil/water separation sludges from the petroleum refining industry, Dissolved Air Flotation (DAF) float (listed as RCRA hazardous waste K048) and API separator sludge (K051), are commonly hazardous because of their content of mobile lead and chromium, and has included them in the lists of hazardous wastes in 40 CFR Part 261, Subpart D.

The Agency believes that a large number of oil/water separation sludges which are similar in composition to DAF float and API separator sludge pose a threat to the environment, and are not managed as hazardous solely because they are generated by units which are not dissolved air flotation devices or API

separators. The Agency has proposed to amend the definition of RCRA hazardous wastes to encompass all primary oil/water separation sludges from the petroleum refining sector. This background document provides evidence to support the Agency's listing effort for these wastes. More specifically, this document presents evidence of environmental damage and waste mobility supporting the Agency's hazard determination.

2. APPROACH

This background document makes and sustains the assertion that the primary oil/water separation sludges studied in this document and covered by the final rule have posed and continue to pose a significant potential for damage to human health and the environment. This assertion is supported by documented instances of damage at a number of sites throughout the United States, and by numerous Agency studies of these wastes in other regulatory contexts.

This assertion is considered in Section 3.0, Recorded Environmental Damage from Petroleum Refinery Oil/Water Separation Sludges. This section presents data from a number of sources. All delisting petitions for K048 and K051 and resultant Agency actions were examined to identify trends and potential damage incidents. The States of Texas, Louisiana, Minnesota, and California were polled for information regarding damage from refinery sludges. Additional information was received from EPA Region IX. Based on an evaluation of these materials, EPA Region VI (Texas, Arkansas, Louisiana, Oklahoma, and New Mexico) was selected for special study. This region was chosen because a large number of refining facilities fall within its jurisdiction. A member of the study group, assisted by Region VI experts, examined both RCRA and CERCLA files at Regional Headquarters in

Dallas and compiled a list of relevant damage cases in the Region. Section 3.0 gives a detailed description of individual damage incidents, along with an overview of some concerns common to many sites handling refinery sludges.

3.0 RECORDED ENVIRONMENTAL DAMAGE FROM REFINERY OIL/WATER SEPARATION SLUDGES

3.1 Delisting Petitions

Sections 260.20 and 260.22 provide opportunities for the regulated community to submit rulemaking petitions to the Agency to modify or revoke aspects of the hazardous waste management system regulations. Section 260.22 specifically provides hazardous waste generators with an opportunity to petition the Agency to remove their wastes, on a "generator-specific" basis, from the lists of hazardous wastes found in 40 CFR §§261.31 and 261.32. These petitions are generally referred to as "delisting petitions."

At least 57 facilities have filed delisting petitions for wastes classified as RCRA Hazardous Waste K048 or K051. The Agency has granted only one of these petitions as a permanent exclusion. Many of the others were found to be incomplete upon review of EPA and were dismissed (after the petitions were given an opportunity to complete their petitions). An additional group of petitions were rendered moot due to the "Skinner memo" and referrals to authorized states. All of the remaining petitions failed to satisfy EPA's delisting criteria when subjected to technical review. The Agency sent these petitioners denial/withdrawal letters, informing the petitioners of the Agency's

intent to publish in the Federal Register a formal denial notice, and providing the petitioners with an opportunity to withdraw their petitions to avoid publication of the negative findings. The single exclusion that was granted was for a waste that had been stabilized using a novel treatment technology. The Delisting Program has not reviewed any petitions for untreated K048 or K051 wastes that met the delisting criteria. This is *prima facie* evidence of the hazard posed by primary petroleum refinery wastewater treatment sludges.

In the petition described below, the Agency found evidence of environmental damage attributable to petroleum refinery wastewater treatment sludges:

Unocal, Nederland, TX (Petition #0486B): The petitioner operated two API separators, generating a total of 1,200 cubic yards of sludge per year. The sludge was managed in an on-site surface impoundment. Ground water downgradient of the surface impoundment contained elevated levels of lead, chromium, and benzene. Sludge samples from the first API separator contained hazardous amounts of 1,4-dioxane. Samples from the second separator contained sufficient quantities of chromium to render them EP toxic, as well as benzene, benz(a)anthracene, and phenanthrene at levels of regulatory concern. Material taken from the surface impoundment showed antimony, mercury, chromium, lead, selenium, benzene, 1,4-dioxane, benz(a)anthracene, phenanthrene, benzo(a)pyrene, and benzo(a)fluoranthene at levels of concern. More specifically, when the analytical data were used as input to the Agency's Organic Leachate Model (OLM) and Vertical and Horizontal Spread (VHS) dispersion model, the predicted concentrations at a hypothetical receptor well exceeded the health-based levels of concern for these constituents.

In the following cases, the Agency determined that the petitioned waste did not meet the delisting criteria and was

likely to cause environmental damage if disposed of in an unregulated manner. The Agency found sufficient basis to deny these petitions, based on waste characterizations. In most cases, ground-water monitoring data were not available (since many of these petitions were submitted before the Subpart F requirements were in place). However, if such data had been submitted, the Agency believes that ground-water contamination may have been detected.

Diamond Shamrock, Sunray, TX (Petition #0416): The petitioner requested an exclusion for K048, generated at a rate of 960 tons per year, and K051, generated at a rate of 20,000 tons per year. The wastes were landfarmed at the time of petition submittal. The Agency granted a temporary exclusion on February 26, 1982. EPA later re-evaluated the petition in the light of the Hazardous and Solid Waste Amendments (HSWA) of 1984, and decided to withdraw the temporary exclusion and issue a denial (date, 51 FR 37148). When the analytical data for the DAF float (K048) was used as input to the VHS model, the Agency found that the predicted compliance-point concentrations exceeded health-based standards for arsenic, antimony, nickel, selenium, benzo(a)pyrene, benz(a)anthracene, benzo(b)fluoranthene, benzene, and dibenz(a,h)anthracene. The API sludge (K051) failed the OLM and VHS model evaluations for arsenic, mercury, antimony, selenium, chrysene, benzo(a)pyrene, benzene, and benzo(b)fluoranthene, benz(a)anthracene, and dibenz(a,h)anthracene.

Hill, Houston, TX (Petition #0202): The petitioner requested an exclusion for API separator sludge and DAF float, produced at a fully integrated refining facility with a refining capacity of 70,000 barrels per day. A sample of the DAF float was found to be EP toxic for chromium. Both the API separator sludge and the DAF float failed the OLM and VHS model evaluation for antimony, chromium, selenium, anthracene, benzene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, chrysene, and phenanthrene. In addition, the DAF float contained hazardous levels of dibenz(a,h)anthracene.

Murphy Oil, Superior, WI (Petition #0441): The petitioner generated 12,100 gallons per year of API separator sludge at

the time the petition was submitted. The sludge was found to be EP toxic due to its selenium content, and failed an OLM and VHS model evaluation for mercury, selenium, antimony, benzene, benzo(a)anthrene, and phenanthrene.

American Recovery, East Chicago, IN (Petition #0585): The petitioner operates an oil recovery facility in a major industrial area, generating a maximum of 720 cubic yards of K048, K049, and K051. Samples of sludge obtained during an Agency spot check were found to be EP toxic for lead, and to fail an OLM and VHS model evaluation for chromium, lead, nickel, benzene, benzo(a)anthracene, benzo(a)pyrene, and phenanthrene.

Rock Island, Indianapolis, IN (Petition #0237): The petitioned waste was a filter cake derived from API separator sludge. Data submitted by the petitioner failed the OLM and VHS model evaluations for chromium, methylene chloride, and benzene. A sample collected during an Agency spot check showed excessive (failing?) levels of benzo(a)anthracene, benzo(a)pyrene, chrysene, fluorene, phenanthrene, and dibenzo(a,h)anthracene.

Exxon, Baton Rouge, LA (Petition #0396): The petitioner requested an exclusion for DAF float that has been mixed with spent biological sludge and dewatered. The Agency evaluated the available analytical data using its Land Treatment Model (LTM), having concluded that the waste would most likely continue to be landfarmed if delisted. The waste failed the OLM and LTM model evaluations for benzo(a)anthracene, arsenic, lead, mercury, and selenium.

BP Alliance, Belle Chase, LA (Petition #0717): At the time of the petition submittal, the petitioner was mixing a series of refinery sludges, listed as RCRA hazardous wastes K048 through K052, treating the combined sludge by solvent extraction, and using the residual waste as a weed killer. The petitioner stated its intent to landfarm the material if an exclusion was granted. The Agency found that the waste failed an evaluation using the OLM and LTM for benzo(a)anthracene and benzo(a)pyrene.

3.2 Superfund Sites

Many abandoned petroleum refineries have been studied in detail by EPA Superfund staff for possible inclusion on the

National Priorities List (NPL), and a number are already included on that list. While it is generally difficult to obtain operational data for these sites or to determine exactly what kinds of wastes were disposed of in particular parts of the facility, Regional NPL coordinators strongly suspect that oil/water separation sludges were responsible for at least some of the observed damage.

Refining Sites on the National Priorities List

NPL Rank	Facility Name	City/County	St
58	Peak Oil	Tampa	FL
71	Gold Coast Oil	Miami	FL
82	Old Inger Oil Refinery	Darrow	LA
122	Sinclair Refinery	Wellsville	NY
183	Brio Refining	Friendswood	TX
229	York Oil	Moira	NY
322	Arrowhead Refining	Hermantown	MN
407	PetroProcessors of Louisiana	Scotlandville	LA
664	Dixie Oil Processors	Friendswood	TX
757	Moss-American (Kerr-McGee)	Milwaukee	WI
818	Koch Refining	Pine Bend	MN
830	Double Eagle Refining	Oklahoma City	OK
839	Fourth Street Refinery	Oklahoma City	OK
867	Pester Refinery	El Dorado	KS

3.3 Region VI Facilities

At least 21 active petroleum refineries in EPA Region VI have come to the notice of the Region because of environmental damage at the site. Environmental damage at refineries is generally attributable to the following contaminant sources (or combinations thereof): crude oil spills, refined product spills, and waste management. For some facilities, contamination is so pervasive that it is impossible to discern sources. Many refineries pump hydrocarbon layers beneath their operations for subsequent product reclamation or refining¹. In 16 of the Region VI cases, the damage was not attributable to refinery sludges, and could be traced to hydrocarbon pools (both crude and product) under the site, or to other sources. In one case, an impoundment containing K051 was located over an old hazardous waste landfill; ground-water damage was observed, but may be due to either the old or the new waste management unit or both. In the following cases, the Agency found clear evidence of ground-water damage from K048 and K051:

Fina, Big Spring, TX: A RCRA Facility Assessment of this site was carried out by the Texas Water Commission in January 1987. The report concluded that "ground-water monitoring data downgradient of...[three API separators] indicated elevated concentrations of benzene, toluene,

¹ Memorandum dated July 22, 1988 from Mark Coleman, Oklahoma Department of Health Services, to Glen Sullivan, Oklahoma Department of Natural Resources.

phenol, and nickel, all of which are present in the wastes handled by these units. Therefore, it is likely that a release has occurred based on the fact that these units are old, in-ground units of questionable integrity." The same investigation showed that 4 surface impoundments received wastewater treatment sludges which are not currently RCRA listed wastes but have been assigned numbers by the Texas Water Commission (TWC 249890, 248620, 240150, and 278620), and that elevated levels of phenol and toluene have been found in ground water downgradient of each of these units.

Navajo, Artesia, NM: At this facility, RCRA wastes K049 through K052 are applied to an on-site landfarm. Due to the similarity of these wastes, the ground-water damage cannot be definitively attributed to any one of them. However, wastewater from the API separators is sent to an evaporation pond via a 3-mile long unlined earthen ditch. In 1981, an inspector noted "a heavy layer of black oil on the top of the water in the ditch and very thick oily deposits on the vegetation and sediments on the banks." Heavy rains in Spring 1979 caused the ditch to overflow and surrounding farmland was contaminated by oily material. In a further investigation in 1985, the ditch and the pond showed "levels of chromium which exceeded the EP toxicity limit for a characteristic hazardous waste." Birds have been killed by, oil in the wastewater evaporation ponds, and the entire pond system is "regularly flooded by the Pecos River." If the effluent from the water side of the API separators has caused this kind of damage, the sludge from the same units would also be expected to be hazardous.

Citgo, LA: At this facility, RCRA hazardous wastes K048, K049 and K051 were co-disposed. A naphthalene plume was observed in the ground water underneath the waste management unit.

Plateau, Bloomfield, NM: EPA Region VI conducted a sampling mission at this site in May 1984. The site has a number of different types of waste management units and there have been on-site oil spills in the past, complicating any interpretation of observed damage. However, the sampling team found that a ditch became contaminated as it passed the API separator ponds, and that the contaminants found in the ditch (polynuclear aromatic hydrocarbons in the water, substituted benzenes in the soil) were also found in samples of the pond sludge.

3.4 California

The State of California lists all primary oil/water separation sludges under California Waste Code 222, and has designated treatment standards for these wastes. These wastes must be treated to reduce the total organic content below 1 percent prior to land disposal. California has determined that this level of source reduction can be achieved by using either incineration or solvent extraction. The State believes that sufficient incineration capacity will not be available in California in the foreseeable future, and that incineration would not allow for the recovery of the oil bound up in these sludges. It has therefore chosen solvent extraction as the Best Demonstrated Available Technology for treating such waste. In the study supporting these treatment standards, the State demonstrates that most oily petroleum wastes, including oil/water separation sludges, exceed EPA standards for benzene, toluene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, arsenic, chromium, lead, dibenz(a,h)anthracene, and phenanthrene.

3.5 Other Damage Cases

As part of this investigation, the Agency reviewed the Damage Incident Data Base for damage cases involving petroleum refineries or refinery waste management facilities. While this data source is by no means exhaustive, several sites of interest were identified:

Frenchy's Oil Company, Crowley, LA: This site consisted of surface impoundments used to reclaim waste oil from barge

cleaning and petroleum plants. Pit sediments showed high levels of heavy metals, oil, anthracene/phenanthrene, and phenols. Visible soil contamination was observed in off-site ditches and in areas where spills had occurred.

Consolidated Oil Sales, Tulsa, OK: This site was a three acre surface impoundment facility for waste oil and sludges that were trucked in from a number of refineries. The waste contained naphthalene, methyl naphthalene, anthracene, phenanthrene, fluoranthene, pyrene, chrysene, benzo(a)anthracene, benzo(b)fluoroanthrene, benzo(k)fluoroanthrene, and benzo(a)pyrene. Surface water samples were found to contain anthracene, phenanthrene, benzene, methylene chloride, and toluene.

4. CONCLUSIONS

This background document has shown clear evidence of the following factors relevant to the listing of oily wastes:

1. Mobile amounts of metals and organics in these sludges, determined using a variety of standardized leaching procedures and fate and transport models, generally exceed regulatory standards, particularly in respect to lead, chromium, benzene, benzo(a)pyrene, benzo(a)-anthracene, benzo(b)fluoranthene, and phenanthrene. Other organics and metals, including selenium, antimony, arsenic, pyrene, toluene, naphthalene, and chrysene are also routinely observed.
2. Improper management of these sludges has resulted in verifiable ground-water damage at a number of active refineries, and is suspected at certain abandoned sites.

In the light of this evidence, it is clear that oil/water separation sludges from the petroleum refining industry is, by reason of their content of constituents listed in 40 CFR Part 261, Appendix VIII and the observed mobility of these constituents, do pose and are currently posing a substantial threat to human health and the environment. Therefore these wastes satisfy the criteria for listing hazardous wastes given at 40 CFR §261.11, and may be listed by the Administrator in order to ensure their safe management.

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**SUPERFUND MANAGEMENT REVIEW
WORKPLAN**

NUMBER: 1.B

TITLE: Address Worst Sites, Worst Problems First

FULL TEXT: After abating the immediate threat, EPA will initiate the earliest remedial work to address those problems that retain high priority when compared with competing problems. (p. 1-10)

LEAD OFFICE: OERR

IMPLEMENTATION PRODUCTS AND DUE DATES:

1. Issue procedures for ranking unplanned "quick" response activities - 10/89
2. Issue final RA prioritization of FY 90 sites - 3/90
 - Complete prioritization of previously unranked 4th quarter constructions, and those projects in quarters 1-3 that have slipped into 4th quarter
3. Issue final procedures for prioritization of FY 91 sites - 6/90
 - Publish RA prioritization procedures to be used in FY 91

FINAL COMPLETION DATE: 6/90